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United States Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555

Perry Nuclear Power Plant  
Docket No. 50-440

Ladies and Gentlemen:

Enclosed is Licensee Event Report 1998-002, "Trip Unit Failure Initiates Reactor Core Isolation Cooling With Subsequent Reactor Scram."

If you have questions or require additional information, please contact Mr. Henry L. Hegrat, Manager-Regulatory Affairs, at (440) 280-5606.

Very truly yours,

Enclosure

cc: NRC Region III Administrator  
NRC Resident Inspector  
NRR Project Manager

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NRC FORM 366 (4-95)		U.S. NUCLEAR REGULATORY COMMISSION			APPROVED BY OMB NO. 3150-0104  EXPIRES 04/30/98							
<b>LICENSEE EVENT REPORT (LER)</b>  (See reverse for required number of digits/characters for each block)								ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 P33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.				
FACILITY NAME (1)  PERRY NUCLEAR POWER PLANT, UNIT 1					DOCKET NUMBER (2)  05000440		PAGE (3)  1 OF 4					
TITLE (4) Trip Unit Failure Initiates Reactor Core Isolation Cooling With Subsequent Reactor Scram												
EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)			
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER		
07	01	1998	1998	-- 002 --	00	07	29	1998	FACILITY NAME	DOCKET NUMBER		
OPERATING MODE (9)		1		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)								
POWER LEVEL (10)		100		20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)		
				20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)		
				20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71		
				20.2203(a)(2)(ii)		20.2203(a)(4)		X 50.73(a)(2)(iv)		X OTHER		
				20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A		
				20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)				
LICENSEE CONTACT FOR THIS LER (12)												
NAME  Sterling W. Sanford, Compliance Engineer								TELEPHONE NUMBER (Include Area Code)  (440) 280-5361				
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)												
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		
B	BN	IMOD	R369	Yes								
B	VI	SOL	A610	Yes								
SUPPLEMENTAL REPORT EXPECTED (14)								EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).				X NO								
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)  On July 1, 1998, at 0805 hours, Perry Nuclear Power Plant (PNPP) experienced a Reactor Core Isolation Cooling (RCIC) system initiation causing the main turbine and both feedwater pump turbines to trip, as designed. The plant automatically scrammed from 100 percent rated thermal power, due to closure of the main turbine stop and control valves. During the associated reactor level transient, the High Pressure Core Spray system initiated and injected into the Reactor Pressure Vessel.  The cause of the RCIC initiation was due to design application of the optical isolator. A capacitor shorted in a division 1 trip unit. The short circuit caused a decrease in the supply voltage. The decrease in voltage allowed the division 1 RCIC initiation logic to be satisfied. It is suspected that transient noise spikes, due to inductive relay kickback, triggered an optical isolator output. The output satisfied the division 2 initiation logic, resulting in a RCIC initiation. (Note: The division 2 logic is physically located in division 1.) The failed and damaged components have been replaced. The initiation relay contacts were verified to be in the proper position. The optical isolator and the division 2 initiation logic relays were bench tested satisfactorily and returned to service. Wiring checks were completed to ensure the installed configuration was as designed.  This report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv) and also satisfies PNPP's Operational Requirements Manual section 7.6.2.1.												

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

**I. INTRODUCTION**

On July 1, 1998, at 0805 hours, Perry Nuclear Power Plant (PNPP) experienced a Reactor Core Isolation (RCIC) [BN] initiation due to a trip unit failure and a spurious optical isolator output causing the main turbine [TA] and both feedwater pump turbines [SJ] to trip, as designed. The plant automatically scrammed from 100 percent rated thermal power, due to closure of the main turbine stop and control valves. During the associated level transient, the High Pressure Core Spray (HPCS) [BG] system initiated and injected into the Reactor Pressure Vessel (RPV). During the transient, RPV water level decreased to approximately 127 inches above the top of the active fuel (TAF). RPV water level was restored utilizing HPCS, RCIC, and the motor driven feedwater pump (MFP).

A NRC notification was made (ENS No. 34462) at 0905 hours in accordance with 10 CFR 50.72(b)(1)(iv) for an Emergency Core Cooling System (ECCS) discharge to the reactor coolant system and 10 CFR 50.72(b)(2)(ii) for actuations of Engineered Safety Features (ESF), including actuation of the Reactor Protection System (RPS). This report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv) and also satisfies PNPP's Operational Requirements Manual (ORM) section 7.6.2.1, which requires a special report submittal following an ECCS actuation and injection into the reactor coolant system. This was the twelfth HPCS injection cycle to date. The injection nozzle usage factor is currently less than 0.70.

**II. EVENT DESCRIPTION**

On July 1, 1998, at 0805 hours, RCIC initiated causing the main turbine and both feedwater pump turbines to trip, as designed. The reactor automatically scrammed from 100 percent rated thermal power, due to closure of the main turbine stop and control valves. Reactor water level decreased, first reaching level 3 (178 inches above TAF), causing a Residual Heat Removal (RHR) [BO] system isolation (applicable valves were already closed), then further to level 2 (130 inches above TAF). HPCS and associated support systems initiated; Balance of Plant [BD] and Reactor Water Cleanup [CE] isolations occurred; and the reactor recirculation pumps [AD] tripped at level 2 as designed. During the transient, RPV water level decreased to approximately 127 inches above TAF. RPV water level was restored utilizing HPCS, RCIC, and the MFP. The plant was stabilized in hot shutdown at a reactor pressure of approximately 875 pounds per square inch gauge with all control rods [AA] fully inserted.

Due to the HPCS diesel start, control room ventilation [VI] was manually shifted to the recirculation mode as required by procedure. The 'A' train tripped during system startup, then the 'B' train was started. A solenoid [SOL] valve was replaced and the 'A' train was restored to operable prior to plant startup.

**III. CAUSE OF EVENT**

Refer to the simplified schematic on page 4 for discussion regarding the cause of this event.

At approximately 0805, on July 1, 1998, a capacitor [CAP] shorted in a Rosemount trip unit (model 510DU). The short circuit caused a 10-12 second decrease in the supply voltage. It is suspected that transient noise spikes, due to inductive relay [RLY] kickback, triggered the optical isolator [OB] output. The combination of the decreased supply voltage and the spurious optical isolator output signal resulted in a RCIC initiation. The fuse supplying the trip unit operated and voltage returned to normal with the RCIC initiation logic locked-in. The cause of this event was determined to be due to the

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inadequate evaluation of the application of the optical isolator circuit design. The power source is subject to voltage spiking which has been shown to cause spurious operation of the optical isolator.

RCIC is a safety related division 1 system and receives low reactor water level initiation signals from division 1 and division 2 RPV level instrumentation. Physical separation of RCIC and the division 2 level instrumentation is accomplished by the use of an optical isolator. The optical isolator receives an input signal on the division 2 low water level side and light triggers an output on division 1. The initiation logic is physically located in division 1.

The transient spikes affected only the output of the optical isolator (division 1 only). No signals were detected on the division 2 side of the optical isolator and no systems or components were affected in division 2. Industry experience has shown that optical isolators can produce spurious output signals due to voltage transients and electromagnetic interference. There was no divisional separation issue associated with this event.

#### IV. SAFETY ANALYSIS

This event is bounded by the Updated Safety Analysis Report (USAR) Chapter 15.2.3, "Turbine Trip," which provides analysis for a variety of turbine or nuclear system malfunctions that initiate a turbine trip. In addition, USAR Chapter 15.2.7, "Loss of Feedwater Flow," assumes a total loss of feedwater flow with make-up to the RPV being provided by ECCS. This transient was bounded by this analysis. The impact of the HPCS initiation and injection, inclusive of fatigue, is enveloped by design analyses for the reactor, reactor internals, and HPCS piping. Therefore, this transient was bounded by existing safety analysis and is considered to have minimal safety significance.

#### V. CORRECTIVE ACTIONS

The following corrective actions have been taken or are in progress:

The failed and damaged components have been replaced. The initiation relay contacts were verified to be in the proper position. The optical isolator and the division 2 initiation logic relays were bench tested satisfactorily and returned to service. Wiring checks were completed to ensure the installed configuration was as designed.

An Operating Experience (OE9124) report was submitted to INPO on this event.

#### PREVIOUS SIMILAR EVENTS

Two previous events resulting in the initiation of the RPV low water level logic for RCIC were reported in LERs 95-005 and 95-008. The events associated with these LERs involved single division power supply failures. Since these events, the logic design has been modified to require a signal from division 1 and division 2 level to cause an initiation. The failure in the July 1, 1998, event produced both division initiation signals from the same division due to the failed trip unit causing a voltage decrease and the optical isolator producing a spurious output. The corrective actions from the previous LERs could not have prevented this event.

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].



## LICENSEE EVENT REPORT (LER)

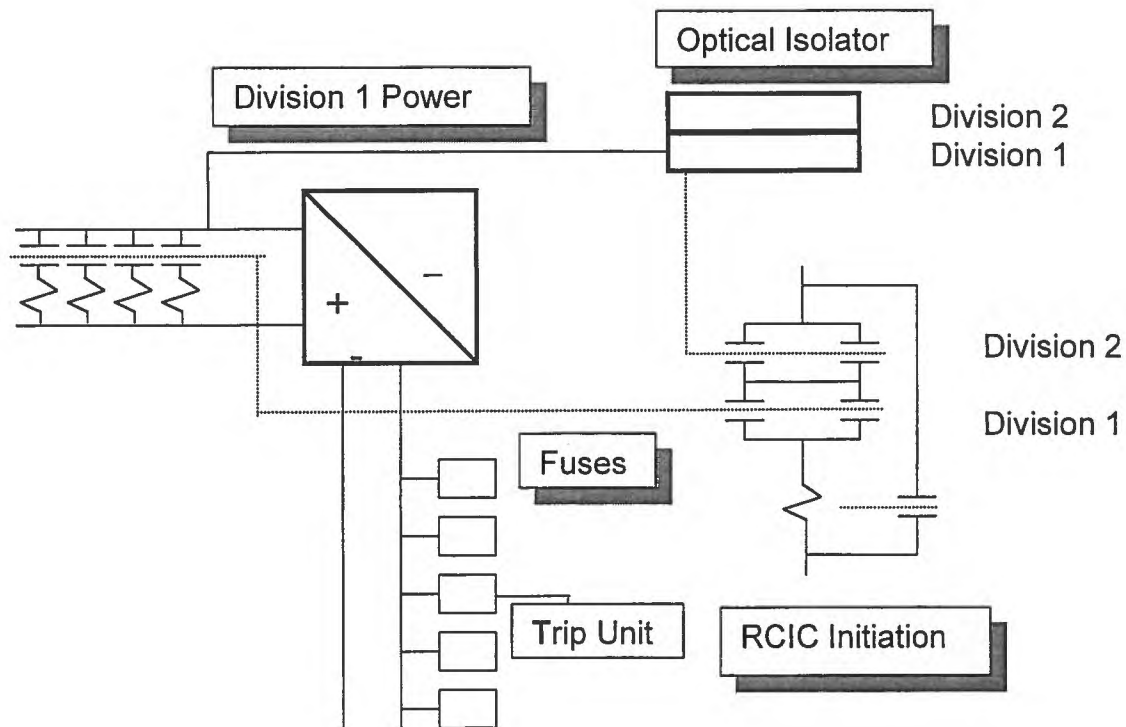
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Simplified SchematicRCIC Initiation

**Note: All components depicted are physically located in division 1  
with the exception of the division 2 side of the optical isolator.**



# CATEGORY 1

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9808040227      DOC.DATE: 98/07/29      NOTARIZED: NO      DOCKET #  
 FACIL:50-440 Perry Nuclear Power Plant, Unit 1, Cleveland Electric      05000440  
 AUTH.NAME      AUTHOR AFFILIATION  
 SANFORD,S.W.      Centerior Energy  
 MYERS,L.W.      Centerior Energy  
 RECIP.NAME      RECIPIENT AFFILIATION

SUBJECT: LER 98-002-01:on 980729,trip unit failure initiated RCIC w/  
 subsequent reactor scram.Caused by design application of  
 optical isolator.Replaced failed & damaged components &  
 verified initiation relay contacts.W/980729 ltr.

DISTRIBUTION CODE: IE22T      COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 5  
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES:Application for permit renewal filed.      05000440

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	NRR/DE/EMEB	1 1	NRR/DRCH/HICB	1 1
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